

exposure to *Pfiesteria* toxins. The money is part of a \$7 million congressional appropriation for study of the organism. Delaware, Florida, North Carolina, South Carolina, and Virginia will also receive research funds from the grant.

Donald M. Anderson, a senior scientist in the biology department at the Woods Hole Oceanographic Institution in Massachusetts and an author of a February 1997 joint report on harmful algal blooms (HABs) by the NOAA Coastal Ocean Program and the National Fish and Wildlife Foundation, says he welcomes the new detection technologies. "This is a very necessary development," says Anderson, who took part in the recent National Sea Grant College Program briefing. "The critical unknown has been whether or not *Pfiesteria* was present, and whether *Pfiesteria* toxins were present."

According to the 1997 report, HABs including *Pfiesteria* outbreaks "are increasing in frequency or severity in many U.S. coastal environments and worldwide . . . [and therefore] pose increasing risks to human health, natural resources, and environmental quality." Baden contends, further, that "*Pfiesteria* really is the least of our problems." Toxins from paralytic shellfish and puffer fish, as well as Florida red tides and European diarrhetic shellfish also cause serious human illness and death, he says.

Though HABs worldwide have been widely associated with excess nutrients in water, Baden points out that Florida red tides have been reported since at least 1844, and paralytic shellfish poisons were described in the 1500s. But public service literature from the National Sea Grant College Program identifies nutrient runoff from residential, agricultural, and industrial areas as "a probable cause of the increase in *Pfiesteria* populations."

Studies of HABs have not been limited to *Pfiesteria*. In New York, for instance, a \$1.5 million project focuses on brown tides—algal blooms that are not toxic to humans, but that affect shellfish reproduction and feeding, says Darcy Lonsdale, a principle scientist for the New York Sea Grant/NOAA Coastal Ocean Program initiative. And in the Pacific Northwest, researchers such as Rose Ann Cattolico, a professor of botany at Seattle's University of Washington, are investigating *Heterosigma*, an algal bloom that now threatens the region's multimillion dollar salmon industry.

But *Pfiesteria* promises to remain a focus of HAB studies, researchers say. "The story of *Pfiesteria* provides a compelling illustration that fish [health] and human

health are strongly linked," Burkholder concludes. "Toxic dinoflagellates can cause serious chronic/sublethal impacts to fish and mammals, as well as other organisms," she adds. "Efforts to improve water quality through reductions in nutrient loading likely will help to protect both our natural resources and our health."

Not surprisingly, a host of policy makers and government agencies have moved to toughen runoff restrictions and provide funding for *Pfiesteria* research. Perhaps most notably, in February President Bill Clinton proposed allocating \$10.5 billion for a Clean Water Action Plan, which includes 110 "key action steps" to make waters safe for fishing and swimming. While the fate of that legislation has not yet been determined, the recently passed Sea Grant Reauthorization Bill will provide close to \$300 million worth of support for *Pfiesteria* research and other marine studies over the next 5 years.

Agreement on Pork Problems

What would you think if a pork production facility 25 miles long with an annual yield of 2.5 million hogs suddenly opened shop in your neighborhood? For the residents of Milford, Utah, this unusual question is a hot topic as Circle Four Farms, the nation's largest hog producer and Milford's corporate neighbor, continues to expand toward this production goal by the end of the decade. Pork production facilities, when poorly managed, have the potential to be environmental pariahs. Animal wastes are usually stored in massive on-site lagoons that, if breached, can have devastating effects on nearby surface water and groundwater systems. Pork production facilities are also associated with excessive nutrient loading, occupational health problems, sickening odors, and even global warming from methane emissions. And as the industry continues to evolve toward dominance by mega-producers such as Circle Four, important

NIEHS Seeks Data on Multiple Chemical Sensitivity

Some scientists have suggested that the boom in petroleum-based products that emerged after World War II, ranging from pesticides to perfumes, has led to a corresponding boom in mysterious illnesses. These highly debated illnesses, which include total allergy syndrome, fibromyalgia syndrome, and chronic fatigue syndrome, are characterized by seemingly rootless headaches, muscle aches, and fatigue.

One such illness, known as multiple chemical sensitivity (MCS), believed by some scientists to be a product of chemical synergy, is thought to occur when exposure to a particular chemical or mixture of chemicals leads to subsequent immune responses, often more intense than expected, to a variety of substances. Although there may be a connection between exposure to petrochemicals and MCS, the mechanisms underlying this connection haven't been elucidated. But the NIEHS is working to change that.

The NIEHS was recently allocated \$400,000 by Congress to study MCS as part of a push to better understand Gulf War illness. Gulf War illness, which reportedly affects over 10% of the veterans who served in the Persian Gulf theater during 1991, features many of the same symptoms as MCS. It is hoped that research on one condition will also reveal information about the other. Congress has also allocated \$300,000 to the Centers for Disease Control and Prevention for similar studies.

The congressional money will augment a request for applications issued last November by the NIEHS for innovative experimental approaches to studying chemical mixtures. Approximately 70 applications were received in response to that request. Says William Suk, deputy director of the Office of Program Development in the NIEHS's Division of Extramural Research and Training, "What's important [about the congressional funding] is that we'll be able to move forward on this problem more quickly."

The genesis of MCS may lie in an initial exposure to a particular chemical, which creates a sensitivity in a susceptible individual. Then, when the individual later encounters similar chemicals, or the same chemical in lower doses, a sudden, severe, and poly-symptomatic response is experienced. But while the popular media are full of anecdotal evidence of a link between health effects and exposures to chemicals such as those found in new carpet and fresh paint, there is presently little hard science to back up such claims.

Recent NIEHS projects involving chemical mixtures include research on endocrine disruptors, food toxicology, and groundwater contamination. Suk says that research currently being done at the NIEHS is relevant to understanding the mechanistic functioning of chemical mixtures, which in some cases may be relevant to MCS; the congressional funding should enable the institute to initiate studies directly related to MCS.